

REMARKS/ARGUMENTS

Claims 9-38 are active. New Claim 38 tracks Claim 9, but has been directed to a process involving immobilizing a nonflocculant yeast to the surface of a chitosan bead and to a process producing a higher number of floating yeast cells in the primary fermentation product(s). Support for immobilization of yeast on the surface of a bead is found in the specification on page 10 and on page 17, lines 7-10; and support for the higher numbers of floating yeast cells in the primary fermentation product(s) on page 9, line 19-page 10, line 2, as well as in Table 4 and pages 21-22 of the specification. Accordingly, the Applicants do not believe that any new matter has been added.

Election/Restriction

The Restriction Requirement has been made FINAL. Currently, the elected species is:

Carrier: chitosan  
Final product: malt alcoholic beverage  
Bioreactor: fluidized bed

The Applicants understand that upon an indication of allowability for a generic claim that additional species will be examined.

Rejection—35 U.S.C. 103

Claims 9, 10, 13-17, 21, 23, 25-28 and 33-37 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sapporo Breweries, JP 6197749, in view of Szlavko, J. Amer. Soc. Brewing Chem. 2:59-60. The Applicants reiterate their prior arguments that the prior art does not disclose or suggest the present invention, particularly immobilization of nonflocculant yeast on chitosan beads, nor provide a reasonable expectation of the benefits obtained by a

process using immobilized nonflocculant yeasts, such as lowered diacetyl (an undesirable “raw” flavor), and offer the following remarks in response to the comments in the Official Action.

Beads. The Official Action indicated that while Sapporo does not use the term “bead”, that it is clear that beads are produced and used by Sapporo. The Applicants disagree that the prior art chitosan gel is the same as the chitosan beads used by the present invention. Chitosan beads are chitosan solidified in a form of beads and have a solidified chitosan layer on their surfaces. In the present invention, yeast is immobilized on the surface of the chitosan beads by soaking the beads in a yeast suspension (page 17, lines 7-10). Since in the process of the invention, the yeast is attached and immobilized on the surface of the chitosan beads, the yeast proliferates on the bead surface, is readily desorbable and floating yeast increases. As a consequence, the amount of diacetyl in the primary fermentation liquid is lowered and diacetyl is further efficiently reduced in any subsequent secondary fermentation (see the specification, page 9, line 10 to page 10, line 19). In addition, carbon dioxide produced as a result of fermentation is readily eliminated and fermentation delays do not occur since the nonflocculant yeast is immobilized on the surface of the chitosan beads.

On the other hand, in Sapporo the yeast is dispersed and entrapped in a jelly-like carrier (chitosan gel). That is the yeast is immersed in a gelling solution and is gelled, resulting in yeast dispersed throughout the gel. Use of chitosan gel instead of chitosan beads does not provide the beneficial effects obtained by the process of the invention (where the nonflocculant yeast is immobilized on the surface of a chitosan bead) as described above, because there is no or little yeast on the surface of chitosan gel, i.e. most of the yeast is embedded in the gel.

The Official Action indicates that “... it is clear that beads are in fact produced and used. On page 2, in the example, of the translation, the yeast are immobilized in cells after

the yeast and gelling material are expelled from double pipe". However, it is impossible to produce beads by the method described in Japanese Patent No. 6197749 and even were this process to produce beads, the yeast would be embedded in the beads and not provide the beneficial effects of the beads of the present invention in which the yeast is immobilized on the surface.

Non-flocculant yeast. The Official Action indicates that the prior art suggests selecting a non-flocculant yeast for the purpose of producing a higher concentration of tryptophol and better flavor. While the non-flocculant yeast described by Szlavko is described as producing higher amounts of tryptophol (a flavor component), there is no suggestion in Szlavko to immobilize this yeast on a chitosan bead, nor any reasonable expectation of obtaining the benefits described above provided by the invention, such as reductions in diacetyl production, nor that under the conditions of the present invention that the Szlavko yeast would produce higher concentration of tryptophol.

Scope of improvements by using nonflocculant yeast. The Official Action urges that the results shown in the specification for yeast strains NA-3 and NA-4 are not commensurate in scope with the claims which are directed to a process using nonflocculant yeasts in general. However, the important functional property of strains NA-3 and NA-4 is their lack of flocculation. This ability is shared by other non-flocculant yeasts. By employing a nonflocculant yeast "the yeast is fully prevented from flocculating within the bioreactor and thereby sedimenting and precipitating" (page 9, lines 12-15) and "the number of floating yeast cells upon the end of fermentation is stably maintained at a level higher than that in the case where a conventional flocculent yeast is used". The higher number of nonflocculant yeast cells results in a reduction of diacetyl (an undesirable "raw" flavor). A process using flocculant yeast would result in flocculation and precipitation of the yeast from the fermentation liquid, fewer floating yeast cells, and consequently a reduced amount of diacetyl

(the undesirable "raw" flavor) removed during both primary and any secondary fermentation. Since nonflocculant yeasts would share these properties, i.e., they would not flocculate and precipitate, in general, any nonflocculant yeast would be expected to function as described within the invention and these properties would not be expected to be limited to only strains NA-3 and NA-4. Moreover, the claims themselves, see e.g., the last wherein clause in Claim 9, clearly describe the characteristics of a nonflocculant yeast. Accordingly, in view of their prior arguments and in view of the remarks above, the Applicants respectfully request that this rejection be withdrawn.

CONCLUSION

In view of the above amendments and remarks, the Applicants respectfully submit that this application is now in condition for allowance. Early notification to that effect is earnestly solicited.

Respectfully submitted,

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